

Appln. No.
Reply to Office Action of 10/28/04

AMENDMENTS TO THE CLAIMS

Please replace all prior versions of the claims of invention with the following claims:

1. (currently amended) A shutdown method for a pressurized water reactor (PWR) following interruption of power operation, the PWR having a reactor coolant system (RCS) including a reactor pressure vessel (RPV) containing fuel assemblies, comprising the steps of:
 - cooling reactor coolant containing dissolved hydrogen in the RCS;
 - adding boron to the reactor coolant in the RCS;
 - adding a decontamination reagent into the boron-containing reactor coolant, the decontamination reagent including a reducing agent to reduce iron and nickel in the RCS and a chelant to complex the iron and nickel;
 - circulating the reactor coolant containing the decontamination reagent through the RCS, including through the RPV containing the fuel assemblies, to dissolve and complex the iron and nickel;
 - removing complexed iron and nickel from the reactor coolant;
 - [after adding at least a portion of the decontamination reagent] while circulating the reactor coolant containing the decontamination reagent through the RCS to dissolve and complex the iron and nickel, degassing the RCS to remove hydrogen gas and then adding an oxidant to oxidize the residual dissolved hydrogen and decontamination reagent in the reactor coolant; and
 - reducing the gamma emitting activity of the reactor coolant.

Appln. No.
Reply to Office Action of 10/28/04

2. (original) The method of Claim 1 wherein the step of adding a decontamination reagent comprises: adding the decontamination reagent to the reactor coolant when the temperature of the reactor coolant in the RCS is between 180°F and 240°F.

3. (original) The method of Claim 2, wherein the step of adding decontamination reagent comprises: adding the decontamination reagent to the reactor coolant when the temperature of the reactor coolant in the RCS is between 240°F and 200°F.

4. (original) The method of Claim 1 wherein the step of adding a decontamination reagent comprises: adding EDTA to reduce the iron and an organic acid to complex the iron.

5. (original) The method of Claim 1 wherein the step of adding a decontamination reagent comprises: adding an aqueous vanadous picolinate solution.

6. (currently amended) The method of Claim 1 wherein the step of removing complexed iron comprises: removing complexed nickel-cobalt along with the complexed iron.

7. (original) The method of Claim 1 wherein the cooling water contains lithium and the step of removing complexed iron comprises: removing the lithium along with the complexed iron.

8. (original) The method of Claim 1 wherein the step of adding an oxidant comprises: adding hydrogen peroxide.

9. (original) The method of Claim 1 wherein the step of reducing the gamma emitting activity comprises: reducing the activity to 0.05 microCuries/cc or less.

Appln. No.
Reply to Office Action of 10/28/04

10. (original) The method of Claim 1, wherein the PWR has a residual heat removal system (RHRS) connected with the RCS, including the additional step of: removing dissolved oxygen from reactor coolant in the RHRS before the step of introducing a decontamination reagent.

11. (original) The method of Claim 1, including the additional step of: adding zinc to the reactor coolant after interrupting the power operation and before restarting the PWR.

12. (original) The method of Claim 11, wherein the step of adding zinc comprises: adding zinc to the reactor coolant while adding the decontamination reagent to the reactor coolant.

13. (original) The method of Claim 12, wherein the step of adding zinc comprises: adding zinc to the reactor coolant while adding the oxidant to the reactor coolant.

14. (new) The method of Claim 11, wherein the method of Claim 1 is followed by the zinc addition step of Claim 11 without first oxidizing chromium in the RCS from a plus three valence to a plus six valence before adding the zinc.

15. (new) The method of Claim 11, wherein zinc is added to the reactor coolant after only one step of adding a decontamination reagent comprising an aqueous vanadous picolinate solution.

16. (new) A shutdown method for a pressurized water reactor (PWR) following interruption of power operation, the PWR having a reactor coolant system (RCS) including a reactor pressure vessel (RPV) containing fuel assemblies, comprising the steps of:

cooling reactor coolant containing dissolved hydrogen and lithium in the RCS;
adding boron to the reactor coolant in the RCS;

Appln. No.
Reply to Office Action of 10/28/04

adding a decontamination reagent into the boron-containing reactor coolant, the decontamination reagent including a vanadous picolinate solution to reduce iron and nickel in the RCS and a chelant to complex the iron and nickel;

circulating the reactor coolant containing the decontamination reagent through the RCS, including through the RPV containing the fuel assemblies, to dissolve and complex the iron and nickel;

removing complexed iron and nickel from the reactor coolant;

while circulating the reactor coolant containing the decontamination reagent through the RCS to dissolve and complex the iron and nickel, degassing the RCS to remove hydrogen gas from the reactor coolant and then adding an oxidant to oxidize residual dissolved hydrogen and decontamination reagent in the reactor coolant;

reducing gamma emitting activity of the reactor coolant; and then without performing a chromium oxidation step subsequent to the step of adding the decontamination reagent including a vanadous picolinate solution to the reactor coolant, adding zinc to the reactor coolant before the completion of the oxidant addition step.